

Patent Claims

1. A security element, preferably for documents of value, which has at least one area (12) with a diffraction structure, which under specific viewing conditions reconstructs a diffractive image, wherein the area (12) has subareas (14), which do not take part in the reconstruction of the diffractive image, and which represent a recognizable information, characterized in that the information represented by the subareas (14) is recognizable substantially only under the specific viewing conditions of the diffractive image.
2. The security element according to claim 1, characterized in that the area (12) has a first reflection layer (26), which supports the reconstruction of the diffractive image.
3. The security element according to claim 1 or 2, characterized in that the subareas (14) have no diffraction structure, and that the first reflection layer (26) is disposed in both the area of the diffraction structure and the area of the subareas (14).
4. The security element according to claim 1 or 2, characterized in that the area (12) has a transparent plastic layer (24), in which the diffraction structure is present in the form of a relief structure, that the first reflection layer (26) is disposed on the surface of the plastic layer (24) which is provided with the diffraction structure, and that the opposite surface of the plastic layer has a second reflection layer (22), wherein the subareas (14) are formed by gaps in the first reflection layer (26).
5. The security element according to claim 4, characterized in that the first and second reflection layer (26, 22) are made of materials having substantially the same reflecting properties, preferably are made of the same material.
6. The security element according to at least one of claims 1 to 5, characterized in that the subareas (14) form overprinted areas of the first reflection layer

(26), wherein the first reflection layer and the overprinted areas have substantially the same reflecting properties.

7. The security element according to claim 6, characterized in that for the overprinted areas a metallic printing ink is used.
8. The security element according to at least one of claims 1 to 7, characterized in that the first and/or second reflection layer (26, 22) is made of a metal layer, such as for example aluminum, gold, copper.
9. A security element, in particular for documents of value, which has at least one area (12) with a diffraction structure, which under specific viewing conditions reconstructs a diffractive image, wherein the area (12) has subareas (14), which do not take part in the reconstruction of the diffractive image, and which represent a recognizable information, characterized in that the information represented by the subareas (14) is recognizable under viewing conditions differing from the specific viewing conditions of the diffractive image.
10. The security element according to claim 9, characterized in that the area (12) has a transparent plastic layer (24), in which the diffraction structure is present in the form of a relief structure, and that the first reflection layer (26) is disposed on the surface of the plastic layer (24) which is provided with the diffraction structure, wherein the subareas (14) are formed by gaps in the first reflection layer (26).
11. The security element according to claim 10, characterized in that the opposite surface of the plastic layer has a second reflection layer (22), wherein the first and second reflection layer are made of differently-colored materials, in particular differently-colored metals, such as e.g. aluminum, copper, gold.
12. The security element according to claim 9 or 10, characterized in that the area (12) is disposed on a transparent carrier, so that the information represented by the subareas (14) is recognizable in transmitted light.

13. The security element according to at least one of claims 1 to 12, characterized in that the security element has at least two areas directly adjoining each other (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9) each having a diffraction structure, which under specific viewing conditions reconstruct a diffractive image, wherein the specific viewing conditions of the areas (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9) differ from each other, and that the areas (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9) have subareas (34A, 34B), which do not take part in the reconstruction of the diffractive images.
14. The security element according to claim 13, characterized in that the areas (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9) have the form of rectangles, strips, circle segments or circular rings.
15. The security element according to at least one of claims 1 to 14, characterized in that at least one of the areas consists of a plurality of partial areas (72-1 to 72-m; 74-1 to 74-m; 96).
16. The security element according to claim 15, characterized in that the partial areas (96) consist of uniform, preferably rectangular pixel elements.
17. The security element according to claim 15, characterized in that the security element has at least two areas (72, 74), which under different specific viewing conditions reconstruct a diffractive image, and which each consist of a plurality of partial areas (72-1 to 72-m; 74-1 to 74-m), wherein the partial areas (72-1 to 72-m; 74-1 to 74-m) of the different diffractive images are interlaced into each other.
18. The security element according to claim 17, characterized in that the security element has an image area (88), which at least upon perpendicular viewing of the security element is recognizable and which consists of partial image areas (88i), wherein the partial image areas (88i) and the partial areas (82i, 84i) of the diffractive images are interlaced into each other.

19. The security element according to claim 17 or 18, characterized in that the partial areas (72-1 to 72-m; 74-1 to 74-m; 82i, 84i) and/or partial image areas (88i) have a strip-shaped geometry, and the partial areas (72-1 to 72-m; 74-1 to 74-m; 82i, 84i) of the different diffractive images and/or the partial image areas (88i) are disposed alternately.
20. The security element according to at least one of claims 17 to 19, characterized in that the strip-shaped partial areas (72-1 to 72-m; 74-1 to 74-m; 82i, 84i) and or the partial image areas (88i) have a width of about 1 micron to about 200 micron, preferably of about 10 micron to 100 micron.
21. The security element according to at least one of claims 15 to 20, characterized in that the information represented by the subareas (76) has a line width, which at least equals to the sum of the widths of the partial areas (72-1 to 72-m; 74-1 to 74-m), which reconstruct different diffractive images, so that the information represented by the subareas is recognizable under the different viewing conditions of the reconstructed diffractive images.
22. The security element according to claim 21, characterized in that the line width of the information is at least 80 micron.
23. The security element according to at least one of claims 15 to 22, characterized in that the pieces of information represented by the subareas of the individual areas (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72, 74) differ from each other.
24. The security element according to at least one of claims 15 to 23, characterized in that the pieces of information represented by the subareas of the individual areas (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72, 74) represent a total information, such as an identification number, a serial number or an optical image.
25. The security element according to at least one of claims 15 to 22, characterized in that the pieces of information represented by the subareas of the individual areas (32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72,

74) are identical and preferably represent an identification number, a serial number or an optical image.

26. The security element according to at least one of claims 1 to 25, characterized in that the viewing conditions of the individual areas (42A to 42D; 52-0 to 52-11; 62-0 to 62-9) are adjusted to each other such that the pieces of information represented by the subareas of the individual areas (42A to 42D; 52-0 to 52-11; 62-0 to 62-9) are successively recognizable on rotating and/ or tilting the security element.
27. The security element according to at least one of claims 1 to 26, characterized in that the area or the areas (12; 32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72, 74) are surrounded by a diffraction structure, which under viewing conditions differing from the specific viewing conditions also reconstructs a diffractive image.
28. The security element according to at least one of claims 1 to 27, characterized in that at least one of the areas (12; 32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72, 74) has a diffraction structure with an asymmetric profile.
29. The security element according to at least one of claims 1 to 28, characterized in that at least one of the areas (12; 32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72, 74) has a rainbow hologram, a volume hologram or a grating structure.
30. The security element according to at least one of claims 1 to 29, characterized in that at least one of the areas (12; 32A, 32B; 42A to 42D; 52-0 to 52-11; 62-0 to 62-9; 72, 74) is formed as an embossed structure.
31. The security element according to at least one of claims 1 to 30, characterized in that security element is formed in a strip shape.

32. The security element according to at least one of claims 1 to 31, characterized in that security element is a security thread, a label or a transfer element.
33. The security element according to at least one of claims 1 to 31, characterized in that the security element forms the embossing surface of an embossing cylinder.
34. A data carrier, in particular document of value, such as bank note, passport, ID card or the like, having a security element according to at least one of the claims 1 to 33.
35. A continuous foil, in particular embossed foil, having a security element according to at least one of the claims 1 to 33.
36. An embossing cylinder, in particular for producing an embossed foil or a security element for a data carrier, the embossing surface of which has a security element according to at least one of the claims 1 to 33.
37. A use of a security element according to at least one of the claims 1 to 33 for the purpose of product protection.
38. A use of a continuous foil according to claim 35 as a label material or security thread material or as a transfer foil.
39. A method for producing a security element, in particular for documents of value with the following procedure steps:
  - a) producing at least one area with a diffraction structure, which under specific viewing conditions reconstructs a diffractive image,
  - b) producing subareas, which do not take part in the reconstruction of the diffractive image, and which represent a recognizable information, wherein the subareas are integrated in the area with the diffraction structure such that the information represented by the subareas is

recognizable mainly only under the specific viewing conditions of the diffractive image.

40. The method according to claim 39, characterized in that in step a) into a transparent plastic layer the diffraction structure is embossed in the form of a relief structure, and the relief structure is provided with a first reflection layer.
41. The method according to claim 39 or 40, characterized in that in step b) the subareas are produced by removing the first reflection layer and/or destroying the diffraction structure.
42. The method according to claim 41, characterized in that the removal or destruction is effected by means of laser.
43. The method according to at least one of claims 39 to 42, characterized in that the plastic layer on the surface opposite to the relief structure is provided with a second reflection layer.
44. The method according to at least one of claims 39 to 43, characterized in that the first and/or second reflection layer are produced by a vapor deposition method.
45. The method according to at least one of claims 39 to 44, characterized in that for the first and second reflection layer the same materials, preferably metals, are used.
46. The method according to claim 39 or 40, characterized in that in step b) the subareas are produced by overprinting the first reflection layer with a neutralizing printing ink.
47. The method according to claim 46, characterized in that a printing ink, preferably a metallic printing ink, is used, which has mainly the same reflecting properties as the first reflection layer.

48. A method for producing a security element, in particular for documents of value with the following procedure steps:
  - a) producing at least one area with a diffraction structure, which under specific viewing conditions reconstructs a diffractive image,
  - b) producing subareas, which do not take part in the reconstruction of the diffractive image, and which represent a recognizable information, wherein the subareas are integrated in the area with the diffraction structure such that the information represented by the subareas is recognizable under viewing conditions differing from the specific viewing conditions of the diffractive image.
49. The method according to claim 48, characterized in that in step a) into a transparent plastic layer the diffraction structure is embossed in the form of a relief structure, and the relief structure is provided with a first reflection layer.
50. The method according to claim 48 or 49, characterized in that in step b) the subareas are produced by removing the first reflection layer.
51. The method according to claim 50, characterized in that the removal is effected by laser.
52. The method according to at least one of claims 48 to 51, characterized in that the plastic layer on the surface located opposite to the relief structure is provided with a second reflection layer.
53. The method according to at least one of claims 48 to 52, characterized in that the first and/ or second reflection layer is produced by a vapor deposition method.
54. The method according to at least one of claims 48 to 53, characterized in that for the first and second reflection layer different metals are used.

55. The method according to at least one of claims 39 to 54, characterized in that in step a) at least two areas with diffraction structures are produced, which under different viewing conditions reconstruct a diffractive image, and which each consist of a plurality of partial areas, wherein the partial areas of the different diffractive images are interlaced into each other.
56. The method according to claim 55, characterized in that the areas are composed of strip-shaped partial areas, which are disposed alternately, and that the subareas are produced with a line width, which at least equals the sum of the widths of the partial areas, which reconstruct different diffractive images, so that the information represented by the subareas is recognizable under the different viewing conditions of the reconstructed diffractive images.
57. A method for producing a document of value, such as a bank note, ID card, passport or the like, with the following steps:
  - a) producing a security element on the document of value, which at least has two areas with diffraction structures, which under different viewing conditions reconstruct a diffractive image, and which each consist of a plurality of partial areas, wherein the partial areas of the different diffractive images are disposed interlaced into each other, preferably they are disposed alternately,
  - b) producing subareas in the partial areas which represent information, without regard as to which diffractive image is to be allocated to the partial area, wherein the line width of the subareas at least equals the sum of the individual widths of the partial areas, which reconstruct different diffractive images, so that the information represented by the subareas is recognizable under the different viewing conditions of the reconstructed diffractive images.